Jump to Navigation

# Quaternary Fault and Fold Database of the United States

**As of January 12, 2017, the USGS maintains a limited number of metadata fields that characterize the Quaternary faults and folds of the United States. For the most up-to-date information, please refer to the interactive fault map.**

## Smith Valley fault zone, unnamed central section (Class A) No. 1291b

**Last Review Date: 1999-03-23**

***citation for this record:*** **Adams, K., and Sawyer, T.L., compilers, 1999, Fault number 1291b, Smith Valley fault zone, unnamed central section, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 12/14/2020 02:15 PM.**

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| **Synopsis** | **General:** This very long, nearly continuous fault zone has: (1) range-front faults bounding east front of Pine Nut Mountains from south end of range to east of Boyle Tunnel and bounding east front of Buckskin Range, Wellington Hills and Sweetwater Mountains; (2) piedmont and intrabasin faults throughout much of Sweetwater Flat, in western and southern Smith Valley, in northwest arm of Smith Valley, and on east piedmont slope of Buckskin Range; and (3) a few intermontane faults east of Desert Creek Peak and in volcanic plateau flanking east side of Pine Nut Mountains near Lyon Peak. Pine Nut Mountains and Wellington Hills represent a west-tilted structural block and Smith Valley probably is a west-tilted half graben based on presence of a marsh on west side of valley near Beaman Lake. Generally, the fault is expressed as scarps on Holocene, upper Pleistocene, and older Pleistocene alluvium and juxtaposes Holocene and upper |

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| | Pleistocene alluvium. Range-front faults juxtapose piedmont-slope deposits against bedrock and are expressed as locally abrupt fronts of Pine Nut Mountains, Wellington Hills, and Sweetwater Mountains. Piedmont faults are marked by a small group of scarps at south end of Smith Valley, adjacent to front of Pine Nut Mountains, Sweetwater Mountains, and Buckskin Range. Some of intrabasin faults in southern Smith Valley and in Sweetwater Flat are characterized by short scarps. Intermontane faults east of Desert Creek Peak are delimited by aligned drainage valleys and ridge-crest saddles, and near Lyon Peak are marked by prominent escarpments, two of which bound a large closed depression that appears to be a graben. Although many of these faults displace only bedrock, some also displace Pleistocene alluvium or juxtapose younger against older Pleistocene alluvium, providing evidence for young movement. Detailed work has not been conducted along entire fault zone; reconnaissance photogeologic and field-based mapping of fault zone are the sources of data. Trench investigations have not been completed, but characterization of the scarp morphology has been accomplished for parts of fault zone in Smith Valley and Sweetwater Flat.<br><br>**Sections:** This fault has 3 sections. Although detailed work has not been conducted along entire fault zone, the sections are defined based on general movement history of fault zone (*e.g.*, Hayes, 1985 #2508; Dohrenwend and others, 1996 #2846). The most recent offset along the central section of the fault is clearly young and probably latest Quaternary; the northern and southern parts of the fault do not seem to exhibit young faulting and are assigned a Quaternary age here. The three sections are described together as a zone because of similar trends, style of movement, and reasonable continuity from north to south. |
| **Name comments** | **General:** Refers to faults mapped by Moore (1961 #2879), Slemmons (1966, unpublished Walker Lake 1:250,000-scale map; 1968, unpublished Reno 1:250,000-scale map), Dohrenwend (1982 #2481; 1982 #2870), Dohrenwend and Brem (1982 #2872), Brem (1984 #2887), Hayes (1985 #2508), Stewart and others (1982 #2873; 1989 #2885), Stewart and Dohrenwend (1984 #2886), Stewart and Reynolds (1987 #2888), and Greene and others (1991 #3487) along east side of Pine Nut Mountains from south end of range to east of Boyle Tunnel, and along east side of Wellington Hills and Sweetwater Mountains. The northern two sections have been referred to as the Smith Valley fault zone (or fault system) by previous investigators. Some of the faults in the southern section are referred to as the Sweetwater Flat fault by |

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| | dePolo (1998 #2845).<br><br>**Section:** Section extends from near south end of Buckskin Range south to where Desert Creek issues from Wellington Hills.<br><br>**Fault ID:** Refers to fault WL14 of dePolo (1998 #2845). |
| **County(s) and State(s)** | DOUGLAS COUNTY, NEVADA<br>LYON COUNTY, NEVADA |
| **Physiographic province(s)** | BASIN AND RANGE |
| **Reliability of location** | Good<br>Compiled at 1:100,000 scale.<br><br>*Comments:* Locations chiefly based on 1:62,500 geologic map of Stewart and Dohrenwend (1984 #2886) and Stewart and others (1989 #2885). Locations were checked against 1:250,000-scale maps of Dohrenwend (1982 #2481; 1982 #2870) which were produced by photogeologic analysis of 1:58,000-nominal-scale color-infrared photography transferred directly to 1:100,000-scale topographic quadrangle maps enlarged to scale of the photographs. |
| **Geologic setting** | This very long, nearly continuous fault zone has: (1) range-front faults bounding east front of Pine Nut Mountains from south end of range to east of Boyle Tunnel and bounding east front of Buckskin Range, Wellington Hills and Sweetwater Mountains; (2) piedmont and intrabasin faults throughout much of Sweetwater Flat, in western and southern Smith Valley, in northwest arm of Smith Valley, and on east piedmont slope of Buckskin Range; and (3) a few intermontane faults east of Desert Creek Peak and in volcanic plateau flanking east side of Pine Nut Mountains near Lyon Peak (Moore, 1961 #2879; Dohrenwend, 1982 #2481; 1982 #2870; Dohrenwend and Brem, 1982 #2872; Stewart and others, 1982 #2873; Stewart and Dohrenwend, 1984 #2886; Brem, 1984 #2887; Hayes, 1985 #2508; Stewart and Reynolds, 1987 #2888; Stewart and others, 1989 #2885; Greene and others, 1991 #3487); Pine Nut Mountains and Wellington Hills represent a west-tilted structural block (Stewart, 1978 #2866). |
| **Length (km)** | This section is 27 km of a total fault length of 88 km. |
| **Average strike** | N10°W (for section) versus N6°W (for whole fault) |

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| **Sense of movement** | Normal<br><br>*Comments:* (Moore, 1961 #2879; Dohrenwend, 1982 #2481; Dohrenwend, 1982 #2870; Stewart and Dohrenwend, 1984 #2886; Hayes, 1985 #2508) |
| **Dip Direction** | E; NE |
| **Paleoseismology studies** | |
| **Geomorphic expression** | Faults in this section are primarily expressed as short discontinuous range-front faults which displace Holocene and older alluvium or juxtapose these deposits against bedrock (Dohrenwend, 1982 #2870; Hayes, 1985 #2508; Stewart and Dohrenwend, 1984 #2886). Some of the scarps on alluvium have been described in the literature. Hayes (1985 #2508) reported scarps on alluvial-fan deposits near Nevada Hot Springs with maximum slope angles of 28y-36y on a scarp with 3.4-4.9 m of dip-slip displacement. Near south end of the section, a 6-km-long, north-trending east-facing scarp is about 1.5 km east of range front, parallel to Desert Creek, and juxtaposes Holocene alluvium against upper Pleistocene alluvium (Dohrenwend, 1982 #2870; Stewart and others, 1989 #2885). This scarp is about 2.5 m high and has a maximum slope of 19y (Hayes, 1985 #2508). South of Wellington, Hayes (1985 #2508) reported scarps on alluvial-fan and colluvial deposits with maximum slope angles of 24y-34y and scarp heights of 4.5-7.5 m. The Pine Nut Mountains form a 1800-m-high escarpment near the central part of this section. dePolo (1998 #2845) reports a maximum preferred basal fault facet height of 232 m (158-256 m). |
| **Age of faulted surficial deposits** | Holocene; Pleistocene; Tertiary. Holocene alluvium is juxtaposed against bedrock along much of section, but older Pleistocene and Tertiary gravel are involved with faulting at north end of section (Dohrenwend, 1982 #2870; Hayes, 1985 #2508). |
| **Historic earthquake** | |
| **Most recent prehistoric deformation** | latest Quaternary (<15 ka)<br><br>*Comments:* Although the time of the most recent event is not well constrained, a latest Quaternary time was reported by Hayes (1985 #2508), which is consistent with Dohrenwend (1982 #2481; 1982 #2870), Stewart and Dohrenwend (1984 #2886), |

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| | Hayes (1985 #2508), and Stewart and others (1989 #2885). |
| **Recurrence interval** | 6-9 k.y. (<18 ka)<br><br>*Comments:* Hayes (1985 #2508) reported a recurrence interval of 6 to 9 k.y. based on dividing the total displacement across compound scarps on Tioga-aged deposits near Nevada Hot Springs by 3 meters, which he assumed was the single-event displacement, and then by dividing the age of the deposits by the number of events. |
| **Slip-rate category** | Between 0.2 and 1.0 mm/yr<br><br>*Comments:* Hayes (1985 #2508) reported an estimated slip rate of 0.36 to 0.41 mm/yr for the Smith Valley fault zone in vicinity of Nevada Hot Springs for the past 18 k.y. However, dePolo (1998 #2845) reinterpreted this same scarp data arriving at an estimate of 0.51 mm/yr, considering the vertical offset to be 5.9 m and the preferred age of the deposit to be 11.5 ka. Nonetheless, these values fall within the assigned slip-rate category. |
| **Date and Compiler(s)** | 1999<br>Kenneth Adams, Piedmont Geosciences, Inc.<br>Thomas L. Sawyer, Piedmont Geosciences, Inc. |
| **References** | #2887 Brem, G.F., 1984, Geologic map of the Sweetwater Roadless area, Mono County, California and Lyon and Douglas Counties, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1535-B, scale 1:62,500.<br><br>#2845 dePolo, C.M., 1998, A reconnaissance technique for estimating the slip rate of normal-slip faults in the Great Basin, and application to faults in Nevada, U.S.A.: Reno, University of Nevada, unpublished Ph.D. dissertation, 199 p.<br><br>#2481 Dohrenwend, J.C., 1982, Map showing late Cenozoic faults in the Walker Lake 1° by 2° quadrangle, Nevada-California: U.S. Geological Survey Miscellaneous Field Studies Map MF-1382-D, 1 sheet, scale 1:250,000.<br><br>#2870 Dohrenwend, J.C., 1982, Surficial geologic map of the Walker Lake 1° by 2° quadrangle, Nevada-California: U.S. Geological Survey Miscellaneous Field Studies Map MF-1382-C, 1 sheet, scale 1:250,000.<br><br>#2872 Dohrenwend, J.C., and Brem, G.F., 1982, Reconnaissance |

surficial geologic map of the Bridgeport quadrangle, Nevada and California: U.S. Geological Survey Miscellaneous Field Studies Map MF-1371, scale 1:62,500.

#3487 Greene, R.C., Stewart, J.H., John, D.A., Hardyman, R.F., Silberling, N.J., and Sorensen, M.L., 1991, Geologic map of the Reno 1° by 2° quadrangle, Nevada and California: U.S. Geological Survey Miscellaneous Field Studies Map MF-2154-A, scale 1:250,000.

#2508 Hayes, G.F., 1985, Late Quaternary deformation and seismic risk in the southern Sierra Nevada Great Basin boundary zone near the Sweetwater Mountains, California and Nevada: Reno, University of Nevada, unpublished M.S. thesis, 135 p.

#2879 Moore, J.G., 1961, Preliminary geologic map of Lyon, Douglas, Ormsby and part of Washoe Counties, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-80, scale 1:200,000.

#2886 Stewart, J.H., and Dohrenwend, J.C., 1984, Geologic map of the Wellington quadrangle, Nevada: U.S. Geological Survey Open-File Report 84-211, scale 1:62,500.

#2888 Stewart, J.H., and Reynolds, M.W., 1987, Geologic map of the Pine Grove Hills quadrangle, Nevada: U.S. Geological Survey Open-File Report 87-658, scale 1:62,500.

#2885 Stewart, J.H., Brem, G.F., and Dohrenwend, J.C., 1989, Geologic map of the Desert Peak quadrangle, Lyon and Douglas Counties, Nevada, and Mono County, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-2050, scale 1:62,500.

#2873 Stewart, J.H., Carlson, J.E., and Johannesen, D.C., 1982, Geologic map of the Walker Lake 1° by 2° quadrangle, California and Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1382-A, scale 1:250,000.